HYDROLOGIC AND DIELECTRIC PROPERTIES OF WOODY PLANT TISSUE: IMPLICATIONS FOR REMOTE SENSING OF CANOPY WATER STATUS

Kyle C. McDonald[1], Reiner Zimmerman[1] Ram Oren[2] and JoBea Way[1]

[1] Jet Propulsion laboratory
California Institute of Technology
4800 Oak Grove Drive
Pasadena, **CA** 91109, U.S.A.
Phone: (818) **354-3263, FAX: (818) 354-9476**
email: mcdonald@blacks.jpl.nasa.gov

[2]Duke University
School of Forestry and Environmental Scien cc
212 Biological Sciences Building
Durham, NC 27706, **U.S.A.**

ABSTRACT

The measurement of xylem water potential provides information about the current water available to plants. Furthermore, the know] edge of actual stand transpiration and canopy water con du ctance provides essent ial inform at ion for esti m at ing canopy carbon, water and energy budgets, '1'bus, successfully coupling remote sensing measurements directl y to canopy water status would c1osc a gap in our ability to estimate these parameters using remote sensing techniques. Connecting canopy water status to variations in observed radar backscatter *via* the plant dielectric constant will demonstrate the capability of using remotely sensed, radar data in ecological studies of canopy water relations.

This paper examines *in situ* observations of hydrologic and dielectric properties of sev-cral t rcc species under different environmental conditions. Characteristics of the dielectric constant measured for the woody plant material are examined together with simultaneous observations of such hydrologic parameters as xylem water potential and xylem water flow, 1)ielectric constant was monitored with either field portable probes or with multi-channel measurement systems designed specifically for continuous monitoring. Results of these measurements indicate that a direct link exists between the dielectric constant of woody plant tissue and xylem water potential, Further examination of the physiological properties of these trees yields an indication as to the interrelationship between the physiological plant processes and dielectric constant,. Inasmuch as radar is sensitive to dielectric constant, the implications of the observed relationship between dielectric and hydrologic parameters on the utility of radar to remotely detect variations in canopy water status arc examined.

This work was carried out at the Jet Propulsion Laboratory, California Institute of Technology, under contract to the National Aeronautics and Space Administration.